Sepsis of Total Knee Arthroplasty After Domestic Cat Bite: Should We Warn Patients?

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One of the most serious complications of any joint arthroplasty is infection. Infection leads to failure and additional procedures. Infections involving total joint arthroplasty have been traditionally classified as early or delayed. Delayed infection can be attributed to hematogenous spread. One such hematogenous spread of infection is from *Pasteurella multocida,* a gram-negative coccobacillus that forms part of the normal gastrointestinal and nasopharyngeal flora of many animals, including cats and dogs.

We present the case of a woman in her mid 80s who was taking anastrozole for breast carcinoma and developed acute septic arthritis of a total knee arthroplasty (TKA), caused by *P multocida,* after a cat bite. We highlight the increased susceptibility of elderly patients with malignancy to contract this infection and the clinician's role in educating these patients to report animal bites immediately. In these cases, early diagnosis and appropriate treatment are essential in salvaging the TKA.

Case Report

A woman in her mid 80s presented to the emergency department with a 2-day history of right knee pain, swelling, and redness; an inability to move the knee; and painful weight-bearing. These symptoms were accompanied by upset stomach and loose stools. Eight to 10 days earlier, a cat had bitten the woman on the anterior aspect of the middle third of the right shin. Nine months earlier, she had undergone a right TKA, and her recovery had been excellent.

The patient had a history of breast carcinoma, for which she was taking anastrozole, and had had a pulmonary embolism after the breast surgery. She had no other medical problems.

On examination, she was afebrile. She had an effusion and a warm, tender knee joint with overlying erythema that blanched on pressure. The scar from the previous surgery had healed well. The wound from the cat bite had formed a scab with minimal surrounding erythema. Right knee range of motion (ROM) was 20° to 45°.

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X-rays of the right knee showed well-aligned, well-fixed TKA components.

C-reactive protein (CRP) was 336 mg/L, erythrocyte sedimentation rate (ESR) was 126 mm/hr, and white blood cell (WBC) count was 11.1 g/dL. Blood cultures were obtained at the same time. The provisional diagnosis was cellulitis over the right knee with suspicion of underlying septic arthritis. The knee was aspirated under strict aseptic precautions and did not yield any fluid. The patient was treated for cellulitis with intravenous (IV) cefuroxime. Metronidazole was added to cover any anaerobes. After 8 to 10 hours, the knee became more painful, and the patient's temperature rose. She was taken to an operating room for arthroscopic washout of the knee. The stool culture was negative. The blood culture and the culture of the fluid aspirated from the knee joint at time of arthroscopy grew *P multocida* sensitive to ampicillin, amoxicillin, cefuroxime, gentamicin, and ciprofloxacin. Cefuroxime was continued, and metronidazole was stopped. The patient's temperature settled, and knee ROM began to improve. After 2 weeks of IV antibiotics, she began a 2-month course of oral ciprofloxacin. CRP, ESR, and WBC count started showing a downward trend.

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By the patient's last clinic visit, 6 months after hospital discharge, she had made a full clinical recovery. She had no pain with full ROM, and her CRP and ESR values had returned to within the normal range.

Discussion

Acute *P multocida* infection after cat bite is well known. Patients undergoing total joint arthroplasty should be made aware of the possible risk of having a pet at home. In addition, they should be instructed to report animal bites in limbs with arthroplasties immediately.

P multocida is a gram-negative coccobacillus that is a normal commensal in the gastrointestinal or nasopharyngeal tract of many livestock, poultry, and domestic pets, including dogs (50%-70%) and cats (70%-90%). Humans usually acquire the infection from bites, scratches, and licks or even with close contact with dogs or cats. In 15% of cases, there is no known animal contact.[1] Dog bites account for 80% to 90% of bite wounds, of which 2% to 20% become infected.[2,3] Cat

bites account for 5% to 15% of bite wounds, of which 30% to 80% become infected.[3] Cat bites are more common in women and are almost always puncture wounds.[2] Complications of animal bites include cellulitis, abscess formation, and bacteremia, leading to metastatic foci in various organs and joints.[1] *P multocida* is identified in 50% of clinically infected dog bites and in 75% of clinically infected cat bites.[4]

Stiehl and colleagues[5] studied the consistent ability of *P multocida* to cause direct and indirect distant seeding of a prosthetic arthroplasty. According to our literature review, 15 TKAs[5,6] (including ours) and 5 total hip arthroplasties[5,7,8] were infected with *P multocida*. Except for 1 case in which the infection was attributed to direct seeding, all cases involved some form of inoculation from a dog or cat.[5] In 3 cases, antibiotics were initiated after the bite, but the patients still developed full-blown septic arthritis of the prosthetic joint.[6,7,9] In such cases, Mehta and Mackie[7] warned against use of inflammatory markers, which may not demonstrate increases in elderly or immunocompromised patients. Treatment ranged from extensive joint débridement and washout with IV antibiotics to 1-stage revision with IV antibiotics and 2-stage revision with adjuvant antibiotics.

Our patient's breast carcinoma, a risk factor for developing infection in these situations, should have warranted early antibiotic therapy. An animal bite over an extremity with a prosthetic joint in an elderly, immunocompromised patient is an indication for antibiotic prophylaxis.[2] Empiric treatment of dog- and cat-bite wounds should be with an antibiotic that has activity against *Pasteurella, Streptococcus,* and *Staphylococcus* species as well as anaerobes. Most commonly used agents include a ß-lactam antibiotic with a ß-lactamase inhibitor, a second-generation cephalosporin with anaerobic activity, or combination therapy, such as penicillin plus a first-generation cephalosporin, or clindamycin plus a fluoroquinolone.[4]

Wound management involves taking a wound history and a patient history and performing a detailed wound examination[2] and then copious irrigation, cautious débridement, appropriate antibiotics, elevation, and immobilization. Twenty-four to 48 hours after initiation of therapy, the patient should be reviewed by the general practitioner or practice nurse.[10]

The use of empirical antibiotics is discouraged in the literature.[11] In our case, antibiotics were used because the patient was initially diagnosed with cellulitis following "dry tap" upon knee aspiration and after sending the blood cultures. High-dose, long-term appropriate antibiotics as per culture growth, however, form an important part of the management of sepsis.

Most reported cases of sepsis have been treated with aggressive débridement or revision. Open irrigation and débridement tends to be more effective than arthroscopic washout.[11,12] Because of the short duration of symptoms in our case, as well as the absence of radiographic features of loosening or infection and the absence of any fluid upon knee aspiration, knee arthroscopy and lavage were performed as a preliminary treatment. Our patient's infection appeared to have been eradicated after arthroscopic lavage and antibiotic treatment.

Based on the clinical presentation of infection, Segawa and colleagues[13] proposed a classification system with four subgroups. Our patient fits into the acute haematogenous group. The recommended treatment for this subgroup is open débridement, synovectomy, and washout with change of insert.[12,14]

In conclusion, we would like to stress that all reported animal bites to a limb with a prosthetic joint should be treated aggressively.

Ways to Inform Your Total Joint Patients

This risk should be listed in patient information sheets, and patients should be urged to inform their primary care physicians or general practitioners about any such occurrences. It is hoped that this form of education will help reduce the incidence of these severe infections. Stiehl and colleagues[5] recommended that patient education cover careful hygiene and exposure avoidance during the postoperative period.

Authors' Disclosure Statement

The authors report no actual or potential conflict of interest in relation to this article.

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This paper will be judged for the Resident Writer's Award.